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UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/626,917	07/25/2003	Chih-Ta Star Sung		3658

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Chih-Ta Star Sung
RM. 308, BULD. 52, NO. 195, SEC. 4,
CHUNG HSING RD., CHU TUNG TOWNSHIP
HSINCHU COUNTY, 310
TAIWAN

EXAMINER
AN, SHAWN S

ART UNIT	PAPER NUMBER
2621	

DATE MAILED: 12/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	**Applicant(s)**
Office Action Summary	10/626,917	SUNG ET AL.
	Examiner	**Art Unit**	
	Shawn S. An	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6-10,12-14 and 16-23* is/are rejected.

7)☒ Claim(s) *5,11 and 15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>25 July 2003</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some *   c)☐ None of:

       1.☐ Certified copies of the priority documents have been received.

       2.☐ Certified copies of the priority documents have been received in Application No. _____.

       3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1.　　The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2.　　Claims 1 and 19-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Koba et al (6,269,174 B1).

　　Regarding claims 1 and 19-20, Koba et al discloses an apparatus/method for motion estimation comprising:

　　a device (Fig. 5) determining/calculating the motion vector (FMV), MV of macroblocks within the current frame or at least one neighboring frame by comparing/searching the targeted macroblock to the neighboring macroblock (col. 10, lines 22-29; col. 7, lines 1-23); and

　　a storage device (Fig. 5, 66) for saving the MV of a partial or an entire frame of the current frame or at least one neighboring frame for the best match macroblock searching of the current or neighboring frames　(col. 13, lines 1-15).

3.　　Claims 16-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Zhu (5,757,668).

　　Regarding claims 16-17, Zhu discloses a method of motion estimation, comprising the procedure of the best match block searching being applied to neighboring blocks of the block having MV different from the frame motion vector (col. 1, lines 41-52).

　　Note: since the frame motion vector was not mentioned/taught/disclosed with respect to the MV as discussed above, and that the above MV was not derived from a frame to frame motion (but rather from a block to block motion), the latter claimed feature of the MV different from the frame motion vector has been met.

Regarding claim 18, Zhu discloses the majority of macroblocks within a frame having to go through the ME procedure (Fig. 1, 104) from time to time (inherency emphasized).

Claim Rejections - 35 USC § 103

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5.   Claims 3-4, 6, 21, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koba et al (6,269,174 B1) in view of Piccinelli et al (6,829,373).

Regarding claim 3, Koba et al teaches estimating/predicting the MV of at least two macroblocks within a frame (col. 2, lines 50-62; col. 3, lines 39-44).

Koba et al does not seem to particularly disclose identifying the majority MV as the FMV.

However, Piccinelli et al teaches auto setting of optimal search window dimensions for motion estimation comprising identifying the majority (maximum) MV to determine the optimal search window for a most efficient video coding (col. 6, lines 37-51; col. 7, lines 24-34).

Therefore, it would have been considered obvious to one of skill in the art employing an apparatus for motion estimation as taught by Koba et al to incorporate Piccinelli et al's teaching as above so as to identify the majority MV as the FMV for a most efficient video coding.

Regarding claim 4, Koba et al teaches that a MV for a particular macroblock can be a good initial approximation for the MV search on sequential frames (col. 3, lines 25-34).

Therefore, it would have been considered obvious to one of skill in the art employing Koba et al's teaching as above to recognize that the FMV can be applied to be the MV of a plurality of macroblocks or to be the initial point of the best match block searching for macroblocks within the neighboring (sequential) frames for performing fast ME.

Regarding claims 6 and 21-22, Koba et al does not seem to particularly disclose previously saved MVs of at least one macroblock of the current or at least one neighboring frames being compared to the predetermined threshold value to determine the initial point of searching for other macroblocks.

However, Piccinelli et al teaches auto setting of optimal search window dimensions for motion estimation comprising previously saved (maximum) MVs of at least one macroblock of the current or at least one neighboring frame (picture) being compared to the predetermined threshold value to determine the optimal search window (would include an initial point of searching for a plurality of macroblocks) (abs.; col. 5, lines 53-65) for a most efficient video coding.

Therefore, it would have been considered obvious to one of skill in the art employing an apparatus for motion estimation as taught by Koba et al to incorporate Piccinelli et al's teachings as above so that previously saved MVs of at least one macroblock of the current or at least one neighboring frame are compared to the predetermined threshold value to determine the initial point of searching for other macroblocks as well as the majority (maximum) MV of the corresponding or neighboring macroblocks of the current frame or at least one neighboring frame is selected as the initial point of searching for a plurality of macroblocks for a most efficient video coding.

6.   Claims 2, 7-9, 12-14, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koba et al (6,269,174 B1).

Regarding claim 2, Koba et al teaches that in many video encoding methods, from a set of equally good macroblocks and motion vectors, which represent the macroblock's position, the one with the minimum length MV is preferable because it requires fewer bits to encode the MV components (col. 1, lines 53-65).

Therefore, it would have been considered obvious to one of skill in the art employing Koba et al's teaching as above to recognize utilizing at least one MV (such as minimum length MV) of the current frame or neighboring frame to encode the MVs of other macroblocks because it requires fewer bits to encode the MV components.

Regarding claim 7, Koba et al teaches a decision being made when all characteristic values of the reference macroblock are within the interval for the same characteristic for the particular macroblock plus or minus a fixed threshold value, and if the decision has been made for the particular macroblock, the MAD is calculated for the pair comprising the reference macroblock and the particular macroblock from the previous fame, and if the resulting value of MAD is less than achieved before, this new value and new MV component values is stored (col. 10, lines 10-29).

Therefore, it would have been considered obvious to one of skill in the art employing Koba et al's teaching as above to recognize that an adaptive threshold can certainly be compared to the MAD of the targets macroblock to determine whether to select or to give up the targeted macroblock which is under the best match macroblock searching just as long as the end result (purpose; finding best match macroblock searching) is substantially the same.

Regarding claim 8, Koba et al discloses applying the adaptively predetermined values of the MV, the MAD, or the block differences (col. 1, lines 53-65; col. 7, lines 52-65; col. 10, lines 22-29) and utilizing a refiner or a coarser pixel resolution as another concept of fast ME method (col. 2, lines 50-67; col. 3, lines 1-22).

Therefore, it would have been considered obvious to one of skill in the art employing Koba et al's teachings as above to recognize applying the adaptively predetermined values of the MV, the MAD, or the block differences to decide a refiner or a coarser pixel resolution as an alternative way of finding the best motion vector, thereby achieving fast ME.

Regarding claim 9, since Koba et al discloses the calculation of the MAD, MV, or block differences for the motion estimation and utilizing the sub-sampled (reduced size macroblock) pixels as discussed with respect to claim 8, it would have been considered obvious for the sub-sampled pixels to be applied to the calculation of the

MAD, MV, or block differences for the motion estimation for the same reason as specified on the claim 8.

Regarding claim 12, since Koba et al discloses utilizing the sub-sampled (reduced size macroblock) pixels as discussed with respect to claim 8, and pixel subsampling based on limiting the number of pixels used in the calculation of matching criteria (col. 2, lines 39-49), it would have been considered obvious to change the position of the pixel selection of the sub-sampling from frame to frame in order to minimize the target matching criterion.

Regarding claims 13-14 and 23, Koba et al teaches ME methods based on doing a preliminary search of motion vectors on a coarse (pixel) resolution and refining the predicted motion vector with fine (a refiner pixel) resolution and similar multiresolution method (col. 2, lines 5-67; col. 3, lines 1-24).

Therefore, it would have been considered obvious to one of skill in the art employing Koba et al's teachings as above to realize that a coarser pixel resolution and a refine pixel resolution can certainly be applied to ME if the MV is smaller/lower and larger/higher, respectively, since smaller/larger MV implies less/more motion was involved, thereby obviating a need for a coarser/refiner pixel resolution to reduce the amount of computations when its not necessary.

7.   Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Koba et al (6,269,174 B1) in view of Chen et al (US 2004/0081361 A1).

Regarding claim 10, Koba et al does not seem to particularly disclose a higher sub-sampled pixels being applied to macroblocks with lower values of MV or MAD.

However, Chen et al teaches a ME method comprising utilizing a higher sub-sampled pixels which results in 4-pixel precision (coarse) MV (conventionally a MV which provides the smallest (lowest) MAD value is selected as the coarse MV), thereby greatly reducing computational load and hardware costs (para. [0058]).

Therefore, it would have been considered obvious to one of skill in the art employing an apparatus for motion estimation as taught by Koba et al to incorporate Chen et al's teaching as above so that a higher sub-sampled pixels can be applied to

macroblocks with lower values of MV or MAD, thereby greatly reducing computational load and hardware costs.

Allowable Subject Matter

8.   Claims 5 and (11, 15) are objected to as being dependent upon rejected base claims 1 and 8, respectively, but would be allowable:

if claim 5 is rewritten in independent form including all of the limitations of the base claim 1 and any intervening claims; and

if either claim 11 or claim 15 is rewritten in independent form including all of the limitations of the base claim 8 and any intervening claims.

Dependent claims 5, 11, and 15 recite novel features, wherein the prior art of record fails to anticipate or make obvious the novel features.

Accordingly, if the amendments are made to the claims listed above, and if rejected claims are canceled, the application would be placed in condition for allowance.

Conclusion

9.   Any inquiry concerning this communication or earlier communications from the Examiner should be directed to *Shawn S An* whose telephone number is 571-272-7324.

10.   The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

11.   Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SHAWN AN
PRIMARY EXAMINER   12/03/06